

A RAINFOREST IN THE BASEMENT: NEPENTHES CULTIVATION UNDER LIGHTS

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The genus *Nepenthes* has good potential for popular cultivation if certain drawbacks can be overcome. In general, its cultural requirements are not all that difficult, although it is a long way from a houseplant. When one considers the lengths that orchid growers will go to provide the necessary cultural conditions for their gems, however, optimism is justified. *Nepenthes*' dramatic pitcher formations provide ample reward for the dedicated hobbyist. As a bonus, plants may throw a spray of hundreds of tiny golden flowers at irregular intervals. Yet *Nepenthes* are all but ignored by the general public. I have been growing the plants for seven years, and can still count other *Nepenthes* growers that I have met on the fingers of one hand. One must reluctantly conclude that social prominence should not be the grower's primary motive for cultivating this genus.

Several factors have contributed to *Nepenthes*' lack of popularity in culture. There is a perceived difficulty in their cultural requirements. Many plants are rather large. The state of the genus' taxonomy is deplorable, and there is little agreement among growers as to whether species and hybrids are correctly labeled. Moreover, the few publications available on the subject tend to assume that one has a large greenhouse available for his or her horticultural efforts. Thus, there is no survey of species and hybrids generally available in cultivation with a view towards identifying acceptable cultural conditions and plants that are amenable to culture indoors. This note will address both of these subjects in the hope of encouraging others to cultivate these charming and unusual plants.

Nepenthes are the largest carnivorous plants. That statement alone is enough to scare away many prospective growers. However, there are no known instances of *Nepenthes* eating children, or even small dogs. *Nepenthes* have no moving parts, unlike some of the more well-known carnivorous species. They must attract their prey by means of color and scent. The plants are native to tropical rain forest and savannah in Southeast Asia, ranging from Madagascar to Australia and Vietnam. There are approximately eighty species, with new ones being described periodically. Various species are considered either lowland or highland types. In addition, a number of natural and artificial hybrids are available.

For purposes of indoor cultivation, *Nepenthes* may be divided into warm, intermediate and cool growers, based upon their general minimum night temperature requirements. Cool growing highland species require a substantial temperature drop at night, to below 55 degrees. Intermediate growers will tolerate a minimum night temperature of 55-65 degrees, or warmer conditions, while warm growers require a minimum night temperature of at least 65. Cool growers, such as *N. edwardsiana* and *N. villosa*, are not generally available. The discussion below, then, will concentrate on factors necessary for successful cultivation of warm or intermediate growers.

THE RAINFOREST

Although some growers report success in a living room environment where plants are grown in a south-facing window, most homes lack sufficient humidity to permit pitcher formation. My house is like most homes. Thus, I required a growing chamber. The chamber needed to be inexpensive and easy to build. The first chamber which I constructed is four feet wide, four feet long and four feet tall, with a two-foot high growing area (figure 1). The frame is lightly constructed of one-by-two inch furniture grade pine, and covered with a rigid
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Figure 1 Greenhouse No. 1 Temporary plastic curtain has been pulled back over lights for photograph.

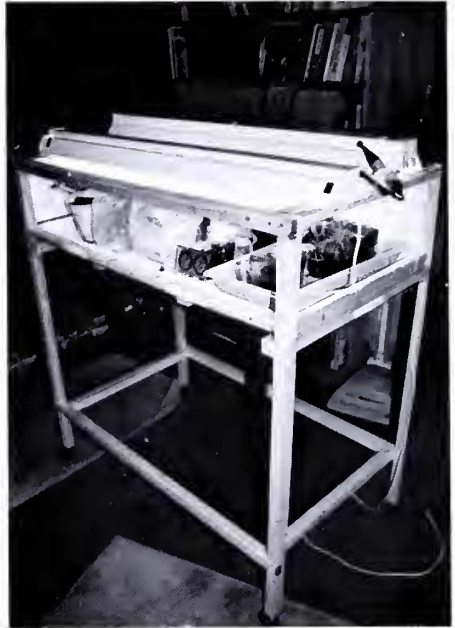


Figure 2 Greenhouse No. 2

plastic sheet on the front and glass on the top. Sides are covered with flexible vinyl sheet secured on the sides and bottom with velcro strips. Inside, the back wall and bottom are painted white with moisture resistant paint. Plastic trays on the bottom hold water for moisture. Plants rest on wood-framed wire platforms of various heights, permitting smaller plants to be as close to the lights as possible. The bottom half serves as a storage shelf.

Soon, that chamber proved insufficient to house the *Nepenthes* and *Phalenopsis* collection. A second chamber has temporarily alleviated the problem (figure 2). This structure, for smaller growing plants, is constructed of 2x3 frame members and encloses a two-foot wide, four-foot long, one-foot deep growing area. It is on wheels.

Cultural requirements for intermediate and warm-growing *Nepenthes* are not difficult. Most writings on the subject stress the need for high temperature, light and humidity. True, *Nepenthes* thrive in a warm, humid environment. However, many species and hybrids do not require extraordinary levels of any condition to grow and form pitchers. Thus, I suggest that the need for each of these three elements has been overstated. Of course, in order for plants to form truly large pitchers, greenhouse conditions, including high levels of these elements, are necessary. But the smaller size of plants and pitchers when grown under less than optimum conditions is not necessarily a drawback, since some types of *Nepenthes* will quickly outgrow a basement growing chamber under optimum conditions.

In short, the relevant inquiry when growing these monsters indoors is not how to provide optimum conditions, but, instead, how to provide the best balance of conditions for compact size with good pitcher form and coloration. In many instances size is the most desirable attribute to minimize. A discussion of the three vital elements—light, temperature and humidity—will illustrate that these plants are not as difficult to grow indoors as was previously imagined.

Light in the first chamber is provided by eight, forty watt fluorescent bulbs to illuminate an area of eight square feet. I use a mix of cool white, warm white and gro-lux (TM) type bulbs. Bulbs need to be changed on an average of once a year. Lights are on a timer which provides a fourteen-to-sixteen hour daylight period. Some supplemental light is provided through two small south facing basement windows.

Pring (1943) reported that a temperature of at least 70 degrees F. is required lest the pitchers turn brown and hard prior to developing. My experience, however, suggests that at least under indoor conditions a seasonal minimum night temperature of 55-60 degrees does not harm intermediate growers so long as the daytime temperature rises to 70. As previously noted, warm growers should have a minimum night temperature of 65 degrees and benefit from daytime temperatures of 75-80.

While average temperatures should not fall below the minimum set out above, established warm/intermediate growers may tolerate short periods of temperatures as low as 45-50 degrees without lasting harm. Two anecdotal experiences illustrate the limits of warm/intermediate *Nepenthes*' cold tolerance.

One cold February, our furnace went out. Typically, it was several days before the landlord could find the repairman. During that time, we subsisted on space heaters, and the temperature in the newly-unheated back room where the plants were located dipped to around 45 degrees for approximately three days. There were no harmful effects. Shortly thereafter, and to our great relief, we moved. The *Nepenthes* were moved to an insulated, but unheated basement. Temperature varied from 80 degrees in July to around 50 degrees during a cold January. the first winter, I initially did not use any supplemental heat source in the chamber, choosing to rely instead on the warmth provided by the fluorescent light ballast. At first, growth merely slowed considerably, which was not unexpected. However, after approximately six weeks below 60 degrees, plants suddenly lost vigor and leaves wilted while still green, even though the soil remained continuously moist. I immediately installed a soil heating cable, but it was too late for many, and nearly half of the collection was lost. The others took several weeks, or in some cases months, to regain their health. Not surprisingly, the lowland, warm-growing species such as *N. ampullaria* and *N. rafflesiana* proved the most susceptible to loss. Hybrids and intermediate growers were more resilient.

Several years later, the collection has recovered. Heating cables are used during the winter, along with a plastic curtain surrounding the growing area. In this manner, a daytime temperature of approximately 70 degrees is maintained in the winter, dropping to around 55 to 60 at night. Plants grow more slowly than in the summer, when day temperatures in the chamber are in the 80's, dropping to 65-70 at night.

Humidity is essential to good pitcher formation. As a general rule, *Nepenthes* cannot have too much humidity. Unlike orchids, they do not seem to require good air circulation. Indeed, some smaller plants thrive inside a closed ten-gallon aquarium inside the large chamber. I grow my warm growers in a closed aquarium upstairs. Cuttings and new arrivals are grown in a clear plastic bag until they stabilize. If a plant is not doing well, it will often improve if placed in a sealed plastic bag for a while. For plants in the chamber, I maintain 55-65 percent humidity by leaving standing water in the trays and misting regularly. Plants themselves should not stand in water for extended periods, but should be kept constantly moist.

A few miscellaneous notes will conclude the topic of cultural requirements. My plants grow in long-fibered sphagnum. It works so well that there is no need to try anything else. Note, however, that sphagnum should be handled with care to minimize the risk of sporotrichosis. I feed plants sparsely with osmocote pellets once or twice a year. Since *Nepenthes* are climbing vines, they will become leggy. When a lead reaches 1-2 feet, I cut it back to under six inches. This stimulates new basal shoots and the cuttings may be rooted.

ILLUSTRATIONS



Figure 3 *N. alata*, December, 1986, grown under lights since 1979. Measurements in background are in centimeters.



Figure 4 *N. reinwardtiana*, December, 1986, grown under lights since March, 1985. Approximately 10 cm.



Figure 5 *N. sanguinea* (? possibly x *wrigleyana*), December, 1986, grown under lights since June, 1986. Approximately 10 cm.



Figure 6 *N. infundibulliformis* (unopened pitcher) December, 1986, grown under lights since July, 1985. Pitcher length approximately 12 cm.

ADAPTABILITY OF SPECIES AND HYBRIDS TO INDOOR CONDITIONS

Warm growers have difficulty thriving under the conditions described above. Generally, they grow for a while, but gradually lose vigor and eventually succumb to rot. Often, lower leaves will become yellow as a first sign of this syndrome. Warm growers include *ampullaria*, *echinostoma*, *gracilis*, *bicalcarata*, *gracillima*, *rafflesiana*, and *tentaculata*. Hybrids of these, such as *x hookeriana* and *trichocarpa*, should be carefully monitored. I am not presently growing any of these except *trichocarpa* and *bicalcarata*, which thrive in a closed aquarium in a sunny upstairs room.

Intermediate growers are stars of indoor culture. They tend to tolerate significantly cooler temperatures than the warm growers. Figures 3-6 illustrate some pitchers that have grown under lights from intermediate growers which thrive and freely pitcher under indoor conditions. Fortunately, this is a large group. Undoubtedly the best plants for these conditions are the *alata* complex. The standard green form, the red form, and the larger 'boschiana' variant all do very well under indoor culture. *Boschiana* has formed pitchers up to five inches long. Yet these plants maintain a compact growth habit. If they get too leggy, they can be cut back and will often send out new basal shoots. The cuttings will root readily.

The following species may also be viewed as intermediate growers: *reinwardtiana*, *albo-marginata* (green), *tobiaca*, *ventricosa*, *infundibuliformis*, *macfarlanei* and *kampotiana* (probably mislabeled). The latter plant has been marketed under a number of names, including *mirabilis* or *thorelli*. I express no opinion on its true name. It is a vigorous grower. Perhaps the clone should be given a generic name, such as "Joe." All of these plants share the desirable trait of compact growth.

Many hybrids are intermediate growers, but the plants tend to be less compact. Some of these plants have similar parentage, according to the comprehensive genealogy set forth by Slack (1983). Intermediate growing hybrids include *coccinea*, *wrigleyana*, *dominii* (? identification), and *williamsi* (and most likely, *chelsonii*, although I have not cultivated it). A plant labeled as the species *sanguinea* shares these attributes, although it looks a lot like *x wrigleyana*. These plants also can be cut back when too large. They will grow from lower buds and basal shoots.

Some intermediate growers will grow well but only rarely form pitchers in the chamber. I conclude that this group needs higher light levels or humidity to form satisfactory pitchers. These include *N. superba* and *balfouriana* (possibly mislabeled). *Boissiensis* (*rubra* and *mastersiana*) also fall into this group but they will form pitchers from new growths.

Several other plants may be identified as intermediate growers on a tentative basis. They have done well, but are too new or have been lost due to moving stress. *Albo-marginata* (red), *fusca*, and *glabratus* were apparently victims of stress due to household moves, but have thrived for a time. *Khasiana* never survives more than one or two years for me. I have heard rumor of a need for a drier semi-dormancy for this species. *Petiolaris*, *khasiana x ventricosa*, and *stenophylla* are doing well but it is too soon to tell. All of these plants, however, have tolerated intermediate conditions for at least a time.

The above notes are indicative of my own experience. Others may have better or worse luck. Seemingly minor variations in temperature and humidity can have a dramatic effect on these unusual plants. However, their unique form makes them well worth growing. They may be obtained from sources listed in CPN.

AUTHORITIES CITED

Pring, *Nepenthes*, XXXI Mo. Botan. Garden Bull. 169 (November, 1943).

Slack, *Carnivorous Plants* (1983)